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GRAIN MARKETING FACILITIES IN THE PIEDMONT AREA OF NORTH CAROLINA



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SUMMARY

The 38 Piedmont counties of North Carolina in 1951 produced 18,561,000 bushels of corn, 5,147,000 bushels of wheat, 8,671,000 bushels of oats, and 1,143,000 bushels of milo.

In 1951 volumes of grains moving off farms in the 38-county area, in bushels, were: corn, 4,273,000; wheat, 3,244,000; oats, 2,951,000; and milo, 653,000. The estimated amounts of grain bought from farmers in 1951 by mills located in 27 counties of the sample area, which included a high percentage of all mills located in the 38 counties, were: corn, 1,643,000 bushels; wheat, 3,320,000 bushels; oats, 1,357,000 bushels; and milo, 825,000 bushels. These amounts included about 76,000 bushels of wheat and 172,000 bushels of milo which were bought from farmers located in border counties in South Carolina and Virginia who trucked their grains to Piedmont area mills.

Individual acreage per farm of all grains is comparatively small, acreage fluctuations are substantial in consecutive years, and weather conditions influence both acreages harvested and yields from year to year. Under the current grain marketing system, the principal reservoir of grain is on farms, where it usually is kept under conditions conducive to deterioration from excess moisture and insect damage. For a desirable system in the area, facilities and practices on farms are necessary to accomplish (1) unloading of bulk grain from harvesters directly into motortrucks, (2) handling of grain in bulk, (3) storage of bulk grain in bins, (4) corn shelling and drying of grain, (5) treatment of grain for prevention of insect damage, and (6) the sale of grain on a basis of grade and quality.

In 1951 bulk grain storage requirements on farms of the area totaled approximately 23,000,000 bushels. About 3,000,000 bushels of satisfactory space is estimated to have been available, leaving about 20,000,000 bushels of improved storage space needed.

Space and facilities at mills are inadequate or completely lacking for unloading bulk whole grain. Most of the millers buy grain, delivered mainly by motortruck, from farmers as needed, keeping only supplies for 2 to 8 weeks of processing. The buying and selling of grain is not on a grade and quality basis, and this fact contributes to confused and unstable price situations. Only a few mills have grain driers and bin space necessary for effective fumigation so that grain can be put into condition for storage or kept in condition while stored.

The mills studied have storage space for approximately 2,500,000 bushels of bulk grain and 750,000 bushels of bagged grain. The quality of this storage space ranges from excellent to poor, and it is estimated that 1,500,000 bushels of space are located in reasonably good facilities. The greatest amount of storage space is located in counties having the largest mills.

These counties produce the largest volumes of farm surplus grains for market. Some counties producing large amounts of grain have relatively little grain storage space.

Approximately 5,600,000 bushels of off-farm bulk storage space was needed to store properly the 1951 marketed grain, of which space about 1,500,000 bushels was available. Additional off-farm bulk storage facilities are needed for a minimum of about 4,000,000 bushels.

Most mills engaged in side-line merchandising of one or more items needed by farmers in local areas. Judging from the experience of grain handlers in other sections of the United States, an expansion of side-line activities would improve the economic stability of the over-all operations of most of the mills in the Piedmont area.

The local mill is the logical point around which the expansion of needed facilities should center, because: (1) Substantial investments in storage and handling facilities have already been made by many mills, and needed additions can be made at less cost than if completely new facilities were constructed; (2) operators of local mills are already the buyers and handlers of area-produced grains and are familiar with local conditions; (3) multiple-job operations including receiving, storing and caring for grains, as well as grain processing, will allow for maximum use of facilities, equipment, and labor at mills and result in the best chance for efficient operating units. To keep labor and management busy and utilize all facilities to the maximum, most local mills with suitable facilities will need to carry on diversified activities.

The construction and operation of public grain storage facilities which would have grain storage space for rent to farmers, mills, or other users, and carry on the grain storage function as a separate and independent enterprise does not appear economically justified at this time. The cost of such an independent operation in the long run would be higher than the costs associated with the expansion of storage facilities at mills where greater economies can be realized in the use of facilities, equipment, and labor.

Under the marketing system and grain handling practices prevailing in the North Carolina Piedmont area in 1951, farmers producing grains were experiencing high economic losses. If all grains were handled in bulk, an estimated annual saving in bag costs and handling labor of \$376,000 would result; and there would be avoided the preventable losses in nutritive and market values of grains caused by high moisture and insect damage, estimated to be \$4,869,000 for a grain crop of the 1951 volume.

GRAIN MARKETING FACILITIES IN THE PIEDMONT AREA
OF NORTH CAROLINA

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INTRODUCTION

This study was made in response to a request from the Chamber of Commerce of Winston-Salem, N. C. It is an analysis of the facilities used in the marketing of grain in the Piedmont area of the State, with the objective of making recommendations for improvements. Field work in the study was carried on in the winter of 1951-52. A preliminary report of some of the findings and recommendations was presented to the Winston-Salem Chamber of Commerce in April 1952.

THE AREA STUDIED 1/

The Piedmont area of North Carolina, for purposes of this study, included the 38 counties indicated in figure 1. This area is served by a network of all-weather, hard-surface highways and local roads. Main or branch line railroads serve all important population centers. A total of 91 flour and feed mills were visited in 27 sample counties of the area. These mills accounted for a high percentage of all the mill activity in the 38 counties. Estimates were obtained from county sources regarding the production of the respective grains in 1951, and the amount of such grains moving off farms. Grain-handling facilities, equipment, and practices were examined at the mills. The amounts and kinds of grains purchased from farmers in the area and from sources outside the area, and other significant data were secured from mill operators. No inquiry was made regarding grain processing equipment or milling procedures and processes, the study being concerned only with whole grain.

1/ Grain production and marketing data, by counties, were obtained from Federal, State, and county agencies for 38 counties. By personal contact at the mills with operators of 91 mills in 27 counties, information and data on grain handling facilities, equipment, and grain marketing practices were secured. Mill operators in the remaining 11 counties were not contacted.

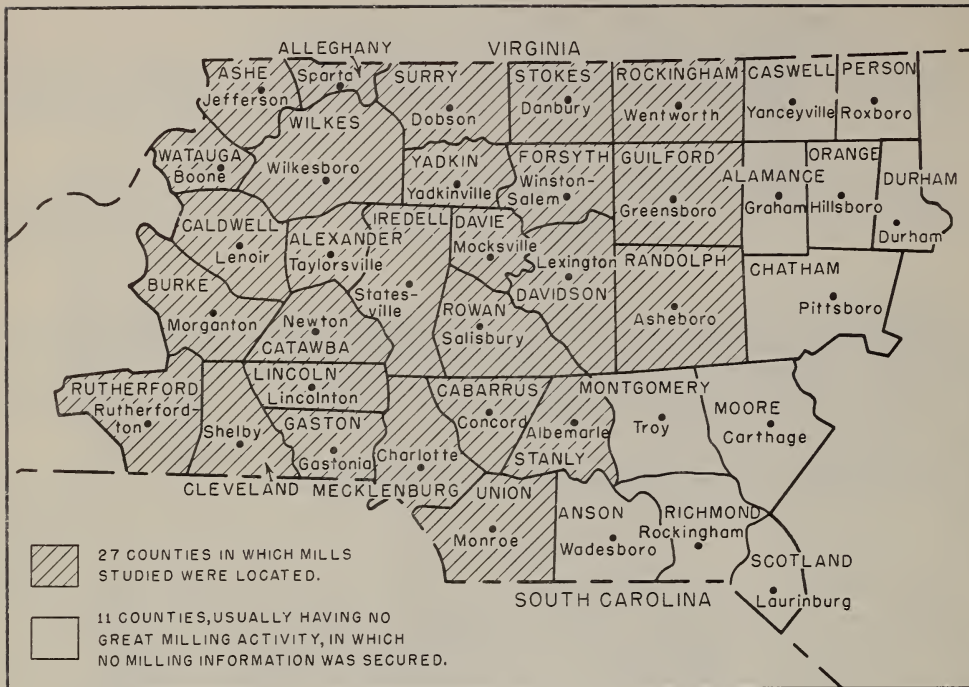


Figure 1.--Area included in the study.

TRENDS IN GRAIN PRODUCTION

In order to determine the amount of grain which may be available for movement through grain facilities at present and in the future, the prevailing cropping system in the 38-county area was examined. The area may be divided with respect to farm cropping systems into three general sections: (1) The northern half of the area produces and markets tobacco as a major cash crop; production of corn and oats as feed crops, and of wheat as a feed and cash crop, is of comparatively minor importance from the standpoint of income. (2) The southwestern portion of the area is dependent primarily upon cotton as a major crop, with a relatively high corn acreage and a smaller amount of wheat. (3) Between these cotton and tobacco sections and in the southeastern portion of the area are farms where neither cotton nor tobacco is generally of major importance, and the production of grains for sale assumes the position of the major farm enterprise.

Corn. Corn occupies the greatest acreage of any crop in the area and has been grown for many decades, principally as a feed crop for farm animals. In the past 10 years, corn acreage has had a downward trend in

all areas, but yields per acre consistently increased during this time, so that total production increased steadily, as shown in figure 2. The reasons for this increase are primarily as follows: (1) Corn is being grown on better land, (2) small grains are being more widely used for winter cover, (3) generally a better crop rotation system is being followed, (4) more fertilizers are being used, and (5) adapted hybrid strains of seed are replacing lower-yielding varieties. The extent to which corn acreage will continue to decrease is not known, but it is probable that the trend in yields per acre will continue to increase with the more general use of hybrid seed and good farming practices. The decreases in numbers of work stock on farms in recent years, with no large increases in other classes of livestock in most areas, have tended to release a greater percentage of corn supplies for sale.

Wheat. Wheat is grown in all counties in the area, with the smallest acreage in the northwestern counties and the greatest concentration of acreage in Iredell, Rowan, Stanly, and Union Counties. The trends in acreage of wheat in all areas have been slightly downward during the 10 years ending in 1950 (fig. 2). During these 10 years the development of new varieties of wheat has increased yields per acre of wheat on those farms where such varieties are grown. The increases in yields per acre which come with the general use of improved seed in the future, other conditions being equal, will lead to increases in total production. In the more commercialized grain-producing counties, improved seed and cultural practices in recent years have tended to offset the declines in acreage.

Oats. Oats have been grown as a minor crop on most farms for many years. In recent years oats acreage has increased greatly in all areas. Yields per acre also have consistently increased, with the result that total production has greatly increased, especially since 1943 (fig. 2). This increase in oats acreage was brought about mainly by the use of oats as a winter cover on crop land. The quality of oats produced in the more concentrated grain-producing counties is quite high, usually has a high test weight per bushel, and is much in demand for commercial feeds.

Milo. The acreage of milo increased greatly in Stanly, Union, and Anson Counties within the past 5 years. Milo is grown as a second crop after oats harvest, and as a substitute for corn. Milo apparently grows successfully during the hot summer weather and the yields per acre are comparatively good. It is thought that the acreage of milo will continue to increase in the most southerly grain-producing counties, where there is an active demand for it for feed mixing and as a corn substitute.

The acreage of any one grain per farm in the area is comparatively small; therefore, the total production comes from many farms having small acreages, rather than a small number of farms having large acreages per farm. Under these circumstances the acreage fluctuations are substantial

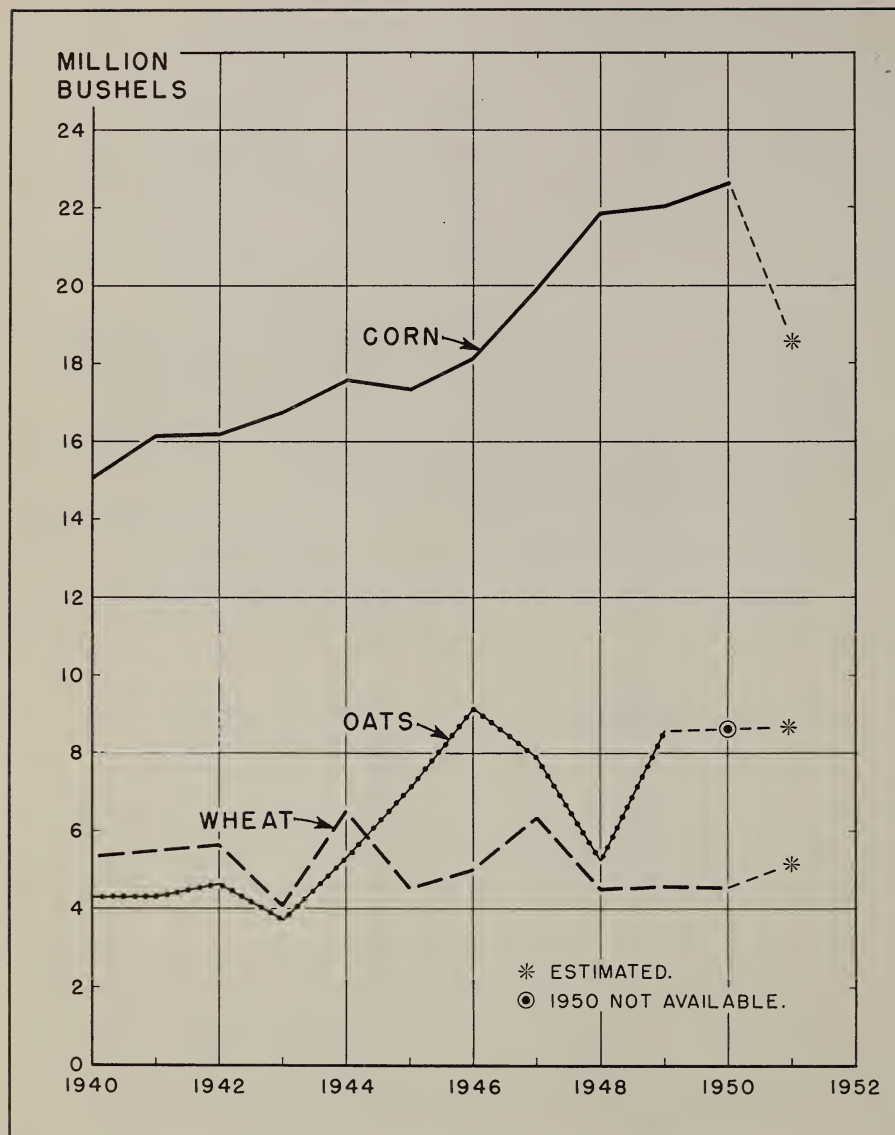


Figure 2.--Production of corn, wheat, and oats in the 38-county Piedmont area of North Carolina by years, 1940-51.

During the 11-year period 1940-51, corn production in the area increased about 50 percent, this increase resulting from a 25 percent decrease in acreage and a 100 percent increase in average yields per acre. In 1951, drought during the growing season decreased yields per acre substantially. From 1941 to 1949 the production of oats nearly doubled, as a result of a 64 percent increase in acreage and a 20 percent increase in yields per acre.

from one year to the next. The yields per acre also are subject to wide fluctuations because of weather conditions. Therefore, for each of the four grains, the amount of grain produced and available for movement from farms in any one year may be substantially different from that in another year.

It was estimated that in 1951 the production of wheat, corn, oats, and milo in the 38-county area was as follows: Wheat, 5,147,000 bushels; corn, 18,561,000 bushels; oats, 8,671,000 bushels; and milo, 1,143,000 bushels. Estimated production by individual counties is indicated in table 1 in the Appendix.

HARVESTING AND MARKET MOVEMENT

Wheat, oats, and milo are harvested in this area with combines that bag the grain, and usually with no bulk storage hoppers on the machines. On farms where tobacco and cotton are the major crops, the farm structures needed to handle these crops are not suitable for the storage of small grains in bulk. The only tightly constructed facility on most tobacco farms is the curing house, constructed to cure tobacco and not to store grain. It cannot be used for both purposes without substantial alterations.

On farms where cribs are available for the storage of ear corn in the husk, the crib construction is designed for drying the corn. On the average farm, the value of the grain involved apparently is not great enough to convince the farmer that building good bins for storage is an economic operation. Few farmers have facilities and equipment to condition grain for storage, even if they did have good bins. In addition, small grain, with a much smaller value per acre or per pound than the cotton and tobacco cash crops, are harvested at a time in June and July when the latter crops demand detailed attention and care.

On most farms, wheat is considered a cash crop, subject to sale as soon after harvest as possible. In some counties where production of oats and milo has increased greatly, they also are considered as cash crops. Lack of adequate storage and grain-handling facilities at the mills for the rapid receiving of grain results, at harvest time, in long lines of farmer-owned and commercial trucks and trailers awaiting unloading. Grain-laden trucks frequently return the grain to the farm where grown, where the farmer stores it in any space that will hold bagged grain. Such space may be on a porch, in a barn loft, in an old shed, or possibly in an insect-infested and rodent-ridden granary. There the grain may remain for several months, deteriorating rapidly in quality, and may eventually be sold as low quality feed grain or fed on the farm to livestock.

In 1951 it was estimated that 3,244,000 bushels of wheat, 4,273,000 bushels of corn, 2,951,000 bushels of oats, and 653,000 bushels of milo moved from farms in the 38-county area, as shown in figure 3. Total volume of grain moving from farms is shown in Appendix table 2.

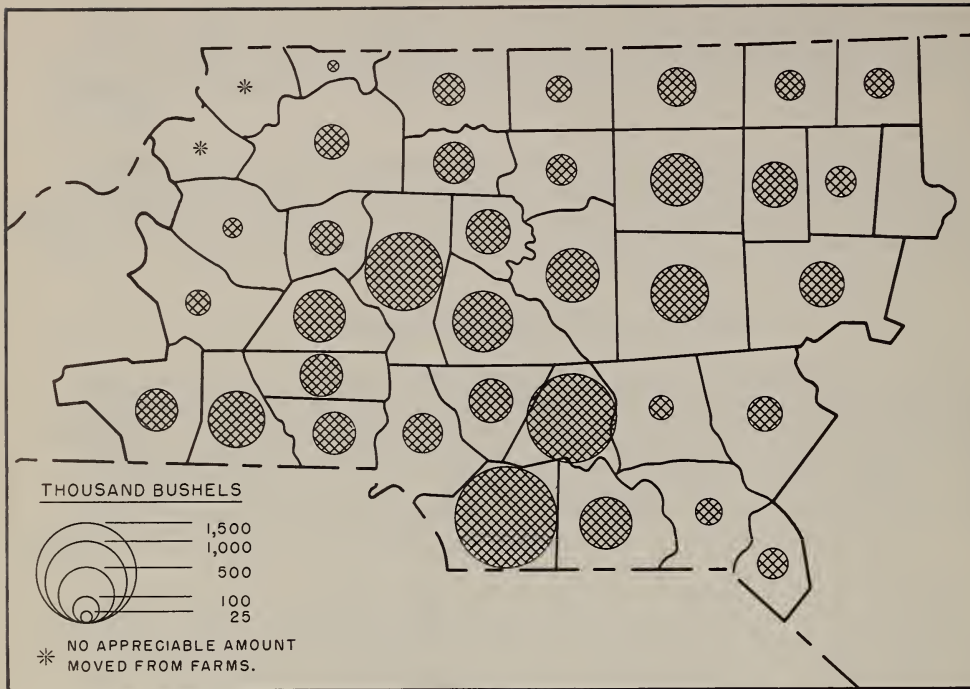


Figure 3.--Estimated amounts of all grains moving from farms, by counties, Piedmont area of North Carolina, 1951.

The greatest volumes of all grains moved from farms in 1951 in Union, Stanly, and Iredell Counties. Counties along the eastern, northern, and western borders of the area had relatively small amounts of grains moving from farms.

OUTLETS FOR GRAIN, GRAIN SUPPLIES, AND FACILITIES

The Piedmont area has no country elevators serving exclusively as local concentration points and shippers of whole grain. It has no public warehousing facilities used primarily for the storage of whole grain. The marketing process for whole grains usually ends when they are received by the mills. The mills not only process grain produced in the area, but many receive for processing grain shipped in by truck and rail from distant points.

The local feed or flour mill in most instances is a rather long-standing institution within the local community. To the extent that the facilities at such mills include storage bins and efficient grain-handling equipment found in grain elevators, such mills can rightly be referred to also as elevators. In a few areas where the local grain receiver has

elevator facilities in connection with the grain processing business, the entire enterprise is known as the "mill" and not the "grain elevator." In past years, most feed and flour mills have acted as the local exchange and processing points for farmers having their wheat and corn processed for farm family and livestock consumption.

Within recent years, the processing and exchange type of operation has tended to decline. Therefore, many of these mills, although still doing some exchange business, have moved further into the production of flour, corn meal, and grits on a commercial scale. Many have gone into the business of processing grains for livestock feed and selling it under their own labels. Most grain is delivered in bags by farmers and is unloaded and dumped at the mills by hand.

Available information indicates that some wheat and corn produced in the Piedmont area in North Carolina move as whole grains west into Tennessee by truck. Some wheat and corn move from the western part of the State into South Carolina and also into the adjoining areas in Virginia. Also, increasing quantities of high quality oats move from the Stanly and Union County producing areas to distant points for specialized uses.

Grain Supplies

The estimated volumes of the four grains bought from farmers and from outside sources by the mill operators interviewed in the 27-county area in 1951 were as follows:

<u>Sources</u>	<u>Wheat</u> <u>Bushels</u>	<u>Corn</u> <u>Bushels</u>	<u>Oats</u> <u>Bushels</u>	<u>Milo</u> <u>Bushels</u>	<u>Total</u> <u>Bushels</u>
From farmers	3,320,000	1,643,000	1,357,000	825,000	7,145,000
From other sources	<u>2,893,000</u>	<u>4,938,000</u>	<u>3,178,000</u>	<u>767,000</u>	<u>11,776,000</u>
Total	6,213,000	6,581,000	4,535,000	1,592,000	18,921,000

The estimated volumes bought by mills, by counties, are shown in Appendix tables 3, 4, and 5. The total supply of grains processed by mills contacted in the 27 counties in 1951 was 18,921,000 bushels, of which 38 percent was bought from farmers and 62 percent was bought from other sources. Mills in Mecklenburg, Iredell, Stanly, and Union Counties processed the largest amounts of all grains, as indicated in figure 4.

About 46 percent of all wheat reported as being purchased by the mills in the 27 counties came from outside areas, and 54 percent came from local farmers. Whether North Carolina soft wheat can be completely substituted for the wheat imported by area mills is a technical question

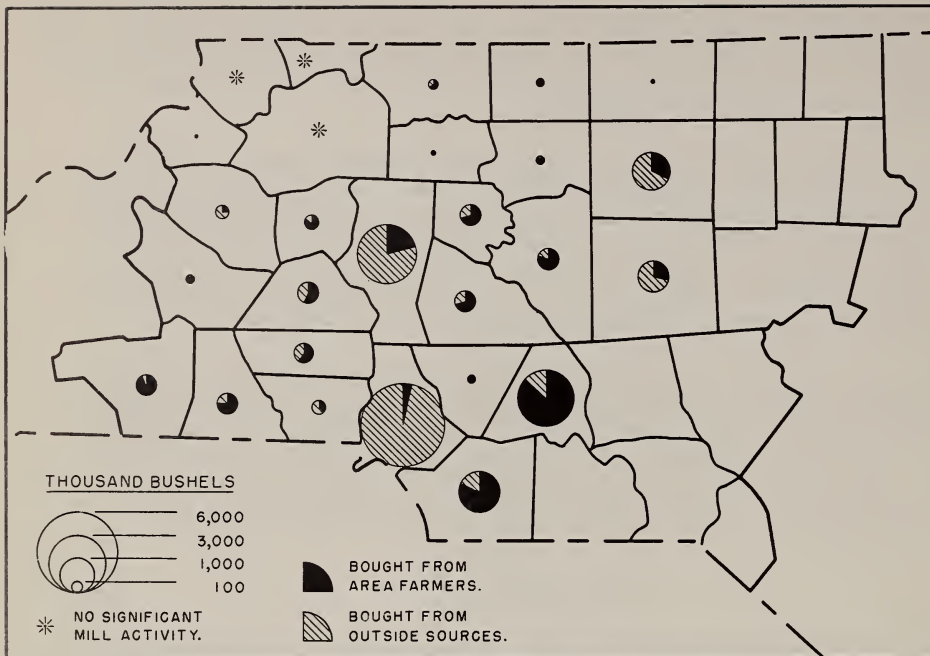


Figure 4.--Relative amounts and sources of grain bought by mills in 27 counties in the Piedmont area of North Carolina, 1951.

Mills in Mecklenburg County reported the purchase of more grain for processing than those in any other county, with mills in Iredell and Stanly Counties next in volumes purchased. Only a small amount of the grain purchased by Mecklenburg County mills came from Piedmont farms, while a high percentage of grain purchased by mills in Stanly and Union Counties came from near-by farms.

not answered in this study. The extent to which wheat was bought at feed grain prices and utilized as feed, rather than for flour, was not ascertained.

Size and Location of Mills

Each of the 38 counties has one or more mills. More than 200 mills, large and small, are located in the area. Area-wide contacts indicated that most of these mills are small, with only week-to-week grain storage capacity, and are operated mainly on an exchange and custom service basis. Because of their similarity, one mill of this type was observed in each county of the area, on the average.

Two of the area's largest mills, one located in Stanly County and one in Iredell County, have grain storage capacities of over 300,000 bushels each, as shown in figure 5. Two mills, each with about a 250,000-bushel

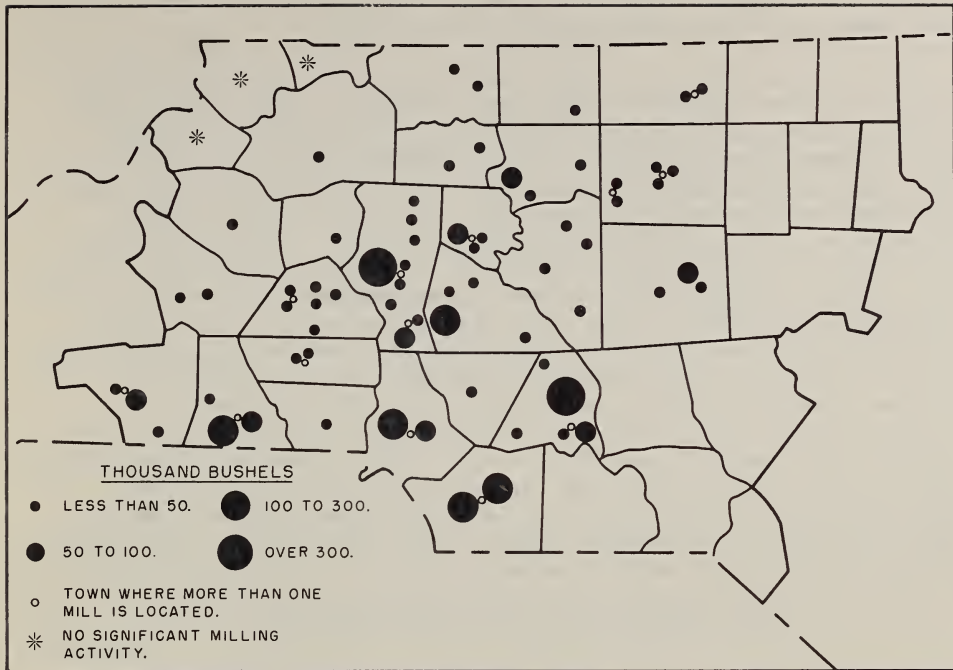


Figure 5.--Approximate bulk storage capacities of the larger mills studied and their approximate location, 27-county Piedmont area of North Carolina, 1951.

Only 10 of the 27 counties in the area have an individual mill with a bulk grain storage capacity of over 50,000 bushels. In certain counties grain sold from farms must be hauled many miles before reaching the local mill which is the only buyer in the county.

storage capacity, are located in Union County. The counties of Mecklenburg, Cleveland, and Iredell each have one mill with approximately 200,000 bushels of storage capacity. Mills with about 100,000 bushels of storage capacity are located in each of the counties of Randolph, Forsyth, Davie, Iredell, Mecklenburg, and Cleveland. Most of the remaining mills, especially those with an appreciable volume of grain storage space, are located in the counties of Cleveland, Rutherford, Catawba, Lincoln, Rowan, Davie, Davidson, Randolph, Forsyth, and Guilford. The locations of some small mills studied, which have no significant bulk grain storage space, are not shown in figure 5.

Included in the 91 mills studied were individual mills of the largest and the smallest sizes. The 91 mills have storage space for approximately 2,500,000 bushels of bulk grain and 750,000 bushels of bagged grain. Seven mills, each with bulk storage space for 100,000 or more bushels of grain,

have a total of 1,386,000 bushels of bulk capacity, which is more than all the bulk capacity of the remaining 84 mills studied.

All of the mills with bulk grain storage capacities of 100,000 to 300,000 bushels are in or near county-seat towns, in which one or more smaller mills also are located. Other mills with low grain storage capacity, or none, are located in or near towns in their respective counties. Most of the mills within town limits are situated in or near the principal business areas of the towns. Of the 91 mills studied, 82 are either in towns without railroad facilities, or their location within the town is several blocks from the railroad, sometimes a distance of 1 to 2 miles. However, nine of the largest mills are located on sites adjacent to railroads, with spur tracks leading to them. Since all mills except two are located on good highways for motortruck transportation, practically all grain marketed from the area, as well as a large volume received from distant points, moves by motortruck.

In the early years of settlement, mill location was usually dependent upon the availability of waterpower, and the mill often became the principal industrial center. In many such instances, the settlement or town grew up around the mill site. Many of the mills built in the early years burned, and the new structures were built on the old mill sites.

Grain Handling Equipment and Practices

When grain is received by a well equipped country elevator, it follows a somewhat standard routing as it moves from one piece of equipment or facility to another. In order that estimates of needed current improvements might be made, descriptions were obtained of grain handling facilities and equipment now in use, in the customary order and sequence as grain is routed.

Sixteen of the 91 mills have motortruck scales with capacities ranging from 6 to 30 tons. No mills have motortruck hoists, but 7 have power shovels with electric motors for pulling bulk grain from motor-trucks and trailers.

One mill has 3 dump pits, each of approximately 300-bushel capacity, and an hourly grain handling capacity of about 2,000 bushels. All other mills have grain hoppers with holding capacities of up to 100 bushels.

One mill has an hourly grain drag capacity of 2,000 bushels, 2 others each have approximately 1,000 bushels hourly capacity, 3 others each have approximately 600 bushels. All other mills have small-capacity drags of 100 to 300 bushels an hour. Almost all drags are of the screw type.

The number of elevator legs per mill ranges from one to seven, but most mills have only one elevator leg for the elevation of grain going into bulk storage. The hourly capacity of elevator legs for elevating whole grain is approximately that of the drags.

All mills have one or more grain cleaners, the number per mill ranging from one to four. Except for six mills which have hourly grain cleaning capacities ranging from 600 to 2,000 bushels, all mills have hourly grain cleaning capacities of 100 to 300 bushels.

Fifty-two mills have corn shellers, mostly of small capacity, but with a range of 35 to 500 bushels hourly. All mills have feed grinders and feed mixers with hourly capacities ranging from 1 to 10 tons.

Only three of the mills studied have grain driers. The 91 mills own and operate a total of 293 motortrucks with individual capacities ranging from $\frac{1}{2}$ to 15 tons.

Eighty-seven of the mills are powered by electricity, one by water, and three by water supplemented with electricity.

Seventeen mills have grain-moisture testers, and 34 have grain weight testers.

Sixty-four mills have flour milling equipment, the daily capacities ranging from a few barrels up to several thousand. Almost all of the 91 mills have equipment for processing corn into corn meal and grits. Many of the mills have equipment for processing the byproducts from the milling of grain, to be sold as such or for use in mixed feeds for livestock.

The managers of 41 mills reported using various types of insect control methods with varying degrees of success. Few of the grain storage facilities and grain handling methods and equipment are designed for control of insects and rodents.

Kinds of Facilities Used for Grain Storage

The grain storage facilities of 73 mills are constructed of wood, and the remainder are either of concrete, or a combination of concrete and metal, concrete and wood, or wood and metal.

All storage facilities for bulk grain are constructed to hold small grains, primarily wheat, to be processed into flour and feed. Most millers are concerned mainly with having space to hold grain bought from farmers, and because the space factor is uppermost in their minds, the construction of facilities for drying grain and treating it for insect infestation is considered to be of minor importance. An example of this practice is illustrated in figure 6. Millers do not buy a year's supply of grain at harvest time. Most of the millers buy from farmers as grain is needed, keeping only supplies for perhaps 2 to 8 weeks of processing.

Some of the smaller grain bins built of wood have concrete foundations and floors, many of them not hopper-bottomed. Other bins are constructed at various floor levels of the main mill structure, in corners and along



Figure 6.--Many country mills receive grain beyond their low storage capacity. Whether grain remains on the farms or at mills, deterioration in most instances is rapid, and the quality loss is reflected in the price received by the producer.

walls or where floor space is not otherwise occupied. In some instances, timber slabs are nailed across window openings to form bin walls for bulk grain. Such construction often required the hand scooping of grain in bulk or into bags, and its transportation by wheelbarrow or cart to another mill area for processing. On the other hand, in the more recently constructed bulk grain storage facilities, built mainly of concrete or metal, mechanical equipment aids in efficient moving of grain into and from the bins.

Most of the facilities built especially for bagged grain are one-story wooden structures. They are roofed with building paper or metal, walled with 2x4-inch studding, and sided with shiplap or weather boarding. Most of the buildings used for bagged grain storage were not built as part of the main mill structure, but were built many years after the construction of the mill. Most of these buildings were built to store not only bagged grain, but other merchandise such as baled hay, bagged feeds, flour, and corn meal. When empty bags are scarce and expensive at harvest time, as was the case in 1951, such space is sometimes filled

with bulk grain, if the floor and walls seem strong enough. Such storage often results in damage to grain, because any grain so stored, whether in bulk or bags, is seldom sufficiently protected or properly handled to prevent substantial loss from insects, molds, and rodents. During and for a few months after the grain harvesting season, any available space, whether it is sheltered or only partially so, both in the mill and outside the main structure, is used for the storage of bagged grain. An objective of most millers is to receive grain, at harvest time or soon after, to the point of filling every foot of space in which grain can be stored, either in bulk or in bags. The space in individual mills for bagged grain ranges from none to 150,000 bushels, but usually from 10,000 to 15,000 bushels.

Practically all mills have platforms, usually 40 to 50 inches high and 6 to 12 feet wide. These platforms are attached to the main mill structures. In the smaller mills much of the platform space is used for bagged grain storage, especially at and following harvest time. Several mills use the space on platforms for storage of unhusked ear corn.

Storage Space for Rent

The Piedmont area has no bulk grain storage facilities for use exclusively as public warehousing, but the managers of 16 mills stated that they offered grain storage space for rent. However, 12 of these said that such grain storage space in their mills is rented to farmers who place their grain in the hands of the mill for future processing on an exchange basis. Only three mills offered storage space for rent to farmers under the uniform grain storage agreement of the Commodity Credit Corporation.

Storage Facilities for Other Supplies

Fifty-one of the mills surveyed sell supplies such as feed concentrates, salt, minerals, oyster shell, poultry and livestock medicines, fertilizer, powdered milk, hardware, seed, fencing, baby chicks, farm implements, eggs, and building materials. The remaining mills either sell no supplies in addition to their processed grains, or the volume handled and the storage space needed are insignificant.

Some mills have substantial, well-constructed buildings of brick and wood, or of wood with concrete foundations, built especially for storage and the merchandising of supplies. Other mills have converted existing structures, usually on the mill site, into storage space for supplies. Mills sometimes use whatever space can be vacated for storage of supplies, or use space which during the peak grain-marketing season is occupied by bagged grain.

GRAIN STORED BY FARMERS UNDER COMMODITY CREDIT CORPORATION
LOAN ON FARMS AND IN PUBLIC WAREHOUSES

More grain was stored by farmers in the area under the CCC loan program in 1951 than in any other year since the program began, and it was estimated that if suitable farm storage facilities had been available, the number of grain loans would have been greatly increased. The first loans in the 27-county area 2/ were made in Stanly County in 1939-40. However, most counties made their first loans in 1949, 1950, and 1951. Data indicate that approximately 227,000 bushels of the 1950 wheat crop were placed under storage loans, much more than the quantity of any other grain under loan. The volume per loan ranged from 30 to 3,700 bushels, and most of the individual loans were on less than 300 bushels.

LOCATION OF OFF-FARM STORAGE IN RELATION TO VOLUME
MOVING FROM FARMS

Counties having the greatest number of mills or the largest have the greatest amount of grain storage space and are, in general, those counties producing the largest volumes of surplus grain.

Data indicate that most counties in the area have less off-farm grain storage space available than would be necessary if farmers marketed their cash grains soon after harvest. In the counties of heaviest production, such as Stanly and Union, off-farm storage deficiencies are the greatest. Also, in some of the counties producing smaller amounts of surplus grains, mills have little storage space. In Davidson County, for example, mills reported the purchase of about 250,000 bushels of grain from farmers in 1951, but they have bulk grain storage for only 19,000 bushels. In Guilford, Rockingham, Stokes, Yadkin, Randolph, and Surry Counties, all of which are in the Winston-Salem section of the area, it was estimated that about 1,600,000 bushels of grain were sold from farms in 1951; mills in these counties reported buying 750,000 bushels, but they have only about 225,000 bushels of bulk grain storage space. Under these circumstances, at harvest times, mainly in June and October, many farmers must depend upon the mills as their primary market. At this time the mills have their bulk bins full and can buy only the grain which can be stored in bags. Under the present system, the reservoir of grain from which mills purchase needed supplies through the year is on the farms where the grain is produced. Most farmers have no adequate facilities on their farms to store grain or to put it in a condition suitable for storage.

As indicated in figure 5, the following counties have only one or two mills acting as the principal buyers of grain from farms: Rockingham, Stokes, Wilkes, Caldwell, Gaston, Cabarrus, Yadkin, Alexander, Burke, and Lincoln. Most of these mills are small and have small grain storage capacities. They buy and process on a small scale. Buying from local

2/ Loan program data were collected only from the 27-county area.

farms is therefore limited, and farmers in these counties are forced to haul their grain to mills in other counties having larger storage and processing facilities.

MAJOR DEFECTS OF THE GRAIN MARKETING SYSTEM

In order to obtain an over-all picture of the improvements needed in the grain handling facilities and equipment of the area, it is necessary first to note their defects. The principal defects may be listed as follows:

The farm level: Most combines do not have hopper equipment for bulk grain, but have attachments which bag the grain in the fields. The handling of grain in bags is a costly operation, because bags have become increasingly expensive, and the labor cost in handling grain by this method is high compared to bulk handling costs. Because only relatively small amounts of small grains are harvested per farm, most individual farmers cannot afford to own combines, but use the services of custom combines, which in many cases harvest the grain with a relatively high moisture content.

Few farmers have adequate bins and equipment on farms for storing grains, preparing them for storage, and keeping them in condition after storing. This is true of all grains produced, including corn. A substantial loss in quality in all grains results from farm storage, irrespective of whether the grains are eventually sold or fed to farm livestock.

Most motortrucks do not have grain-tight bodies, and therefore they can haul grain in bags more conveniently than in bulk, as shown in figure 7. Many man-hours are lost by farmers and truckers lining up at mills (fig. 7) awaiting their turns to dump grain from bags into the usual one or two grain dumps.

Buying point level: Too few mills have facilities such as motortruck scales, truck hoists, grain dump pits, etc., for receiving grain in bulk. Grain cannot be received in bags with any reasonable speed, because the carrying and dumping of bags takes much time and labor, as shown in figure 8. The absence of motortruck scales at the mills makes the weighing of only one or two bags at a time as they are taken from the farmer's truck a further bottleneck in the receiving of grain.

Most mills have much less than enough bulk bin storage space to hold all the grain offered for sale during the first 2 or 3 months after harvest time, as shown in figure 9. Many mills use structures of all types for the storing of grain in bags as offered by farmers after harvest, and most of these structures are not suitable or equipped to keep grain in good condition. Almost all mills are without driers and many do not have the bin space necessary for effective fumigation so that the grain received can be put into condition for storage.



Figure 7.--A transport truck, with 600 bushels of bagged shelled corn and two trailer loads of wheat from farms await the slow bag-unloading operation at one of the larger flour and feed mills. Truck lift equipment and other facilities necessary for efficient bulk unloading are not available at this mill.



Figure 8.--It took four men about 2 hours to unload 400 bags (about 600 bushels) of shelled corn from this truck, and about the same time to load. With a grain-tight body on the truck, and good bulk handling equipment for bulk loading and unloading both these jobs could have been done in less than 30 minutes by one man.



Figure 9.--The storage of unhusked corn on this mill platform or in any other roofed area for eventual husking, shelling, and milling leads to losses in quality caused by heavy weevil damage. No efficient method of controlling weevil infestation in unhusked ear corn is known. Much of the initial infestation occurs in the fields before harvesting. Bagged unhusked ear corn and other grains are often stored on the platforms.

General: The economic loss from deterioration in quality caused by high moisture content and insect infestation is estimated by numerous grain buyers and by the State Department of Agriculture to be no less than 15 percent of the total value of the grain crops produced each year. A high percentage of this total loss occurs on the farms where the grain is produced.

The failure to use effectively the commonly accepted standards of grade and quality in most grain transactions contributes greatly to a confused and unstable price situation. Apparently many farmers are not aware that the discounts applied at many mills for garlicky wheat, insect damage, and other quality deterioration factors are a necessary reflection of the value of the grain when used by the mills. Some mills tend to apply discounts to a substantial proportion of all receipts from farmers, irrespective of quality.

Some millers reported that many farmers apparently are not aware that their grains, when stored on their farms, suffer any great losses in nutrients and quality. If the grain is sold in the spring and discounts for loss of quality are applied, the reasons for the low sale price are either not explained or are not recognized. The farmers often attribute the low price to deliberate designs of the mill operator and lack of local competition. Data indicate that for the area as a whole, prices usually advance seasonally, but the quality of grain offered for sale declines rapidly, especially during the later months of the marketing season.

In the corn and wheat belts of the Middle West, a standard grading system for all marketed grains is used. In those areas, sellers of high quality grain are paid for high quality, and sellers of low quality grain are encouraged to eliminate the practices causing low quality and heavy price discounts.

The lack of substantial movement of grain, especially wheat, from North Carolina to outside markets, hinders the use of outside market prices as a basis for comparison and competition with local area prices, and thus contributes further to instabilities in area prices.

In the less concentrated production areas grain selling points are too far removed from the farms to make the hauling of the small lots to such distant points an economic practice. This is particularly true in the northern section of the area, where the amount which can be processed in existing mill capacity is small compared to the amount of grain moving from farms. Much of the grain from this area moves in small lots through three or four counties to markets farther south until buyers are found.

NEEDED IMPROVEMENTS ON FARMS

If improvements are to be had in the grain marketing system of the Piedmont, participation in the endeavor will be needed from all who handle grain. When the needs are fully recognized, each segment of the system, consisting primarily of (1) the grain producers and (2) the grain buyers, will strive to meet its own responsibility. To meet the basic on-farm needs of an efficient grain marketing system, the adoption of improved grain handling practices, facilities, and equipment, as needed, are recommended as follows:

- A. Installation of attachments on combines and other harvesting machinery to handle bulk grain and convey it directly to motortrucks.
- B. Harvesting mature grain in order that moisture be at a safe level.
- C. Use of grain-tight motortruck bodies.

D. Construction or improvement of grain storage facilities on farms:

- (1) To store bulk farm-held grain.
- (2) To prevent damage by rodents.
- (3) To permit fumigation for insect control.
- (4) To protect from weather.

E. Use of the grain-drying service of mills and elevators for grain that is to be held on farms, and use of grain drying equipment on farms.

F. Delivery of high quality grain to buyers on a graded basis.

The volume of grain production per farm, the time of harvest, probable damage from insects, amounts moving from and remaining on farms, utilization of crop, demand for the crop, and other factors are substantially different for each grain crop grown in the area.

The points in the marketing system where facilities would do the best job at the lowest cost, and preserve the quality of the crop, dictate to a great extent the location and the most practical kinds of facilities needed. Facilities and grain-handling practices on farms are known to influence the entire grain marketing system.

Improvement of Farm Facilities and Practices

Of the total of 33,522,000 bushels of grains produced in the area, about two-thirds, or 22,348,000 bushels, remained on farms. ^{3/} Grain facilities and handling practices in a good marketing program include those needed by farmers to care for grains consumed by livestock on farms, as well as for grains intended for market.

The first step toward improvement on many farms may be that of installing grain hoppers on harvesting machinery, to permit the direct loading of bulk small grain into motortrucks. This eliminates the use of grain bags, and reduces the labor cost involved in handling grain from the time it is harvested until it is received by the buyer.

In order to handle bulk grain, motortruck bodies and endgates should be grain-tight. Many motortrucks now have slatted body walls and endgates. Tarpaulins fitted into slatted motortruck body walls are a poor makeshift. Adoption of grain-tight bodies implies that all grain coming from the harvester will thereafter be handled in bulk, whether it is to remain on the farm or to be marketed immediately.

^{3/} Insofar as available, all data used are approximately accurate. Therefore, in most instances, the term "approximate" has been deleted as it applies to estimates based upon available data.

Whether grain is to be fed to livestock or retained on the farm for later delivery to market, storage facilities and the care given it during its retention should be such as to prevent deterioration. All grain should be sheltered from the bad effects of weather insofar as possible. Such storage will either maintain grain quality or, if possible, improve it. If grain is to remain on the farm for the feeding of livestock, it should be promptly conditioned for safe storage. If it is in storage condition when harvested, it should be placed in insect-free bins, constructed to prevent rodent damage and to permit fumigation for insect control.

Whether grain is to remain on farms or to be marketed, the moisture content is an important factor affecting the maintenance of quality. If stored in properly constructed bins, some grains, low in moisture at harvest, may lose moisture to the point of safety. However, small grains of high moisture content stored in bulk retain a high percentage of the moisture present at the time of harvest and, under some atmospheric conditions, may acquire more. Therefore, grains from many farms should be artificially dried, both those which are to be marketed later and those which are to remain on farms. In order to determine the types of storage construction needed, and the best practices to follow in the drying process, the conditions on the individual farm, as well as the availability of off-farm drying facilities on a custom service basis, must be determined for each kind of grain.

Grain of high moisture content deteriorates rapidly in the best of bins. Insects can destroy grain values in both good and poor storage bins. Therefore, good storage and conditioning facilities may be defined as that combination of facilities which will: (1) Dry the grain to a point where excess moisture will not lead to deterioration in quality while in storage; (2) eliminate insects in all of their various stages so that they will not consume stored grains nor contribute to hot spots in the grain, thus permitting deterioration; and (3) not harbor grain-damaging insects. In North Carolina, where either high moisture content or insect infestation, or both, are prevalent in most years, adequate grain bins for the treatment of grain for insect infestation and for the turning of grain to maintain condition are an integral part of any good grain storage operation.

No study was made of the cost of drying grains on farms with portable drying equipment in comparison with the cost of drying grain at mills as a custom service for farmers. In many sections where grain production is relatively small per farm, and where the total amount of grain produced in the service area also is small, the installation of a relatively high-cost grain drier may not prove feasible. The alternative may be the use of lower-cost portable driers which visit the farms when needed.

The treatment for insect infestation in grain apparently can be done effectively by farmers, provided proper storage bins are available on farms. Small storage bins on farms producing small amounts of grain would

involve a comparatively small investment per farm. No specialized types of equipment are necessary for fumigating except grain-tight bins. The corn crop, however, must be husked and shelled, and put into the bins in bulk, since there is no known effective low-cost method for treating unhusked ear corn for insect infestations. Treating shelled corn in bins to prevent insect damage is comparatively simple.

The need for improvements in farm facilities and handling practices varies according to the type of grain involved and the way it is to be used. For example, facilities and practices applicable to corn may or may not be applicable to wheat.

The economic and physical circumstances in the Piedmont area indicate that, under an efficient marketing system, it would be advantageous if most of the corn and oats were stored on farms, either where grown or where they are to be fed to livestock. Most farmers sell corn from their farm supplies when they determine that they will have a surplus above livestock needs. Therefore, the facilities available for storing and caring for the farm's corn supply should also be used to store and care for the part of the crop which eventually may be sold from farms. Corn supplies produced in the area fall far short of milling requirements.

Grain Storage Facility Requirements On Farms

The following approximations of grain storage space requirements on farms in the area are calculated from estimates of production, utilization, and movement from farms. The proportion of production of the respective grains on the average individual farm is approximately the same as the proportion of such grains throughout the area. Exceptions to this are certain counties, such as Cleveland, which grow greater proportions of corn than the average for the counties studied, whereas Stanly and Iredell grow greater proportions of wheat. Also, wheat, oats, and corn are grown generally on the same individual farms, while milo is grown on only a limited number of farms. The utilization of a unit of storage space on the individual farm for corn in October, and of the identical space for oats the following June, assumes that both corn and oats are produced on the same farm.

About 70 percent, or 13,000,000 bushels of the estimated production of 18,561,000 bushels of corn in 1951 remained on farms. The remaining 5,500,000 bushels was eventually marketed as a cash crop, of which 1,000,000 bushels is estimated to have moved off farms promptly as harvested. This left 4,500,000 bushels to be marketed during the next 11 months. Because grain remaining on farms, whether for 1 or 11 months, should have proper care and storage, facilities for storing approximately 17,500,000 bushels of corn would be needed.

Of the approximately 8,700,000 bushels of oats produced in 1951, about 1,000,000 bushels moved off farms promptly after harvest. This leaves, in round numbers, 7,500,000 bushels for market and farm

utilization during the remainder of the year. This volume would require storage space, but oats are harvested mainly during the same month as wheat. Therefore, 7,500,000 bushels of oats could occupy a portion of the on-farm storage space for corn between June and October, until storage space is needed for the new corn crop. Meantime, part of the oats will have been utilized on the farm and some will have been sold as a cash crop. Because the corn harvest extends into late November and early December, the period during which some oats could occupy the space may be prolonged. By the time all of the corn crop has been harvested, enough of the on-farm oats will have disappeared to make available the estimated storage space of 4,500,000 bushels needed for oats.

Under an efficient marketing system, with farmers having good grain markets readily available and a more plentiful supply of feed grains produced on their farms, wheat would tend to be considered more as a cash crop and less as a feed crop. Under these conditions, 80 percent or more of the wheat crop might be moved from farms soon after harvest. The estimated production of wheat in the area in 1951 was 5,147,000 bushels. On this basis, the 20 percent remaining on farms would be about 1,000,000 bushels. Since the corn storage bins on the farms would be nearly empty of corn at wheat harvest in June, the wheat supply remaining on farms could occupy such bins from June to October, or longer in some cases. About 550,000 bushels of the wheat remaining on farms would usually not be used for fall wheat seeding until after corn harvest, so there would still be a need for about 550,000 bushels of on-farm storage space for wheat at corn harvest time. The remainder would be utilized on farms and for milling exchange, and most of it would disappear by the time storage space was needed for corn.

It was estimated that about 1,140,000 bushels of milo were produced in 1951 in the area, of which one-half was used on farms. Milo is harvested at about the same time as corn, but is grown only in a few of the larger wheat-growing counties of the area. Therefore, in addition to the space required for the corn crop, about 500,000 bushels of storage space would be needed on farms for milo when the production is at a level of 1951.

The foregoing estimates indicate on-farm grain storage space requirements of approximately 23,000,000 bushels, to be occupied at different times of the year by volumes of grain in bushels as follows: Wheat, 1,000,000; oats, 7,500,000; milo, 500,000; and corn, 17,500,000, or a total of 26,500,000 bushels. This volume of grain, because of different times of harvest and the rates of utilization on farms, can be stored in about 23,000,000 bushels of space. It was estimated that good storage space was available on farms in 1951 for not more than 3,000,000 bushels. Therefore, there was a need at that time for better farm storage facilities for about 20,000,000 bushels.

When the facilities and the practices as above recommended have been installed on farms, producers will be in a favorable position to deliver

quality grains into market channels. They can then demand that their grain be sold on a graded basis and that prices received for grains can be on a basis of delivered quality.

Cost of On-farm Grain Storage Facilities

In the Piedmont area, where can additional permanent grain storage facilities be provided at least cost?

In other areas, where large volumes of grain are produced and marketed, efficient systems of marketing have been developed and are in use. The practices relating to location of grain storage facilities vary by areas, depending upon the prevailing type of agricultural economy. In such areas, storage facilities for corn and oats are usually provided on the farm, but the major part of the marketable wheat crop moves to market at harvest or soon after.

Reliable sources of information indicate that in the Piedmont area the cost of constructing wooden grain storage facilities on farms ranges from 30 cents to 75 cents per bushel of capacity. The location, materials used, and method of construction materially affect the cost per bushel. For example, if a grain bin is built in an existing structure where materials and labor are required for only a part of the facility, the per bushel construction cost may be as low as 30 cents. However, if the facility is built from the ground up, entirely separate from any other structure, the cost may be as high as 75 cents per bushel of capacity. In 1951 a grain bin, built of lumber, separately constructed, with dimensions of 6 by 6 by 12 feet, with a capacity of approximately 220 bushels, cost about 54 cents per bushel capacity. This bin is designed to be filled to a depth of 4 feet, with work space between the top of the grain and the rafters for insect prevention treatment. Construction costs for larger bins may be determined on the basis of 6-foot extensions. On the basis of the preceding figures, the current construction cost per million bushels of capacity would be between \$300,000 and \$750,000. Prorated over a period of 20 years, the annual storage cost for materials and construction of a bin of 220-bushel capacity would be between 1.5 cents and 4 cents a bushel. Construction costs per bushel of capacity of bins with larger capacity, but still 6 feet wide and 6 feet high, would be a little less than for smaller bins.

Comparable data concerning the cost of metal bins of small sizes as compared to wooden bins are not available. However, metal bins have certain advantages over wooden bins. They are air-tight and allow for effective fumigation. They will last longer than wooden bins when given reasonable care. They are easier to set up, are rodent and insect proof, are easier to keep clean, and usually may be moved from one place to another much easier than wooden bins. The advantages of metal bins over wooden bins would tend to offset their possible greater cash costs.

On some farms where large volumes of grains are handled, the use of a portable grain conveyor or elevator may also be economically feasible. The annual amount of grain handled, availability and cost of farm labor, and other factors should be considered. Conveyors vary in hourly capacity and dimensions, and in other respects. The cost of a portable conveyor with motor, grain hopper and other supplemental equipment to do the job on farms handling 3,000 to 5,000 bushels of grain ranged from \$300 to \$750 in 1951. Allowing for a 10-year liquidation period on initial cost only, the conveyor cost per bushel would range from approximately 1 cent to 1.5 cents.

In the Piedmont area, the total volume of available commercial grain storage space in 1951 for farmer-owned grain was small, but where it was available, the current storage rate per month was $1\frac{1}{2}$ cents per bushel.

NEEDED IMPROVEMENTS OF OFF-FARM FACILITIES AND PRACTICES

In general, to meet the basic off-farm needs of an efficient grain marketing system, it is recommended that improved grain handling facilities, equipment, and practices be adopted, where they are lacking at off-farm receiving points, as follows:

For grain buyers:

A. Install or improve mechanical equipment for handling bulk grain, such as:

- (1) Motortruck scales and hoists.
- (2) Grain dump grates.
- (3) Grain dump pits with ample capacity.
- (4) Grain conveyors, elevator legs, grain cleaners, and other equipment coordinated for speed and capacity in grain handling.
- (5) Storage for bulk grain.
- (6) Driers for drying high-moisture grain.
- (7) Grain grading equipment.

B. Improve practices to:

- (1) Reduce labor and prevent delays in grain receiving line.
- (2) Turn and condition grain regularly, when needed.
- (3) Permit fumigation for insect control.
- (4) Prevent rodent damage.
- (5) Buy and sell grain on the basis of grades.

The volume of grain to be handled in an individual mill will determine the size of the facilities and equipment needed. However, the minimum requirements in essential facilities and equipment for efficient handling of grains as received from farms by mills or elevators are described in greater detail as follows:

1. For a mill receiving grain from the local trade area, a motortruck scale large enough to accommodate at least a large farm truck; and for a mill receiving bulk grains from more distant points in trailer trucks, a motortruck scale of 50-foot length with a weighing capacity of no less than 30 tons.

2. Grain sampler, weight tester, and moisture tester to help determine grade of grains.

3. A grain truck hoisting device for elevating the front end of a motortruck so that grain will flow from the rear of the truck body by gravity. If it is anticipated that grain will be received in semi-trailers holding large volumes, a power-operated platform lift is desirable. In some installations such a lift is combined with a scale mechanism, using one platform for weighing and dumping.

4. Grain dump pits with dump grates into which grain can flow by gravity from trucks. The dump pit should be large enough to hold the largest truckload of grain expected. In elevator operation, much inconvenience and delay may be caused by grain dump pits of too small capacity. A separate dump pit may be required for ear corn, because of the different size of grate needed and the different movement of the ear corn through husking, shelling, and cleaning machinery. Dump pits can be used interchangeably for shelled corn, oats, wheat, and other small grains. The number of dump pits to be installed will be governed by the kinds and grades of grain received, anticipated grain volume, and the desired receiving capacity. In the Piedmont area, the amount of grain brought to the elevator in one load by a farmer usually is comparatively small, and in most cases it is in bags. In order that such grain may be unloaded without undue delay, additional dump pits for bagged grain in a separate driveway may be advisable, so that the total volume received may be kept high.

5. Grain conveyors or drags, either of the gravity or power type, to move the grain from the dump pits.

6. Elevator legs or vertical conveyors to move grains and any other materials from the boot pit to higher levels. A grain elevator receiving a variety of grains and ear corn for shelling, usually needs two elevator legs as an absolute minimum. It is probable that when large volumes of white and yellow ear corn, wheat, and oats are received at one time, a minimum of three elevator legs may be needed and the investment may be justified. One leg can be fed intermittently from several dump pits by separate drags. It has proved more convenient in many elevators to have four legs of medium to small capacity, rather than two larger legs having the same total capacity.

7. A cleaner or separator to separate foreign materials such as stones, chaff, straw, dirt, etc., from grains. In most well-equipped installations the cleaner is fed directly from the leg head, and the grain flows from the separator or cleaner to the distributor.

8. A distributor to receive the grain directly from the cleaner or separator, and direct it into chutes leading to storage bins, motortrucks, or rail cars.

9. In elevators designed to ship whole grains in rail cars or motortrucks, an automatic scale to weigh grain on its way to such cars or trucks from storage bins or from the distributor. Grain usually moves to the automatic scale by gravity chute and leaves in the same manner, the weights being recorded on the scales.

10. If it is anticipated that an elevator will act only as a receiving point for grain from farms and will ship promptly to other points, the amount of storage space needed, as related to total volume handled, may be comparatively small. If the elevator is to be operated in connection with a grain processing plant, the demands of the plant for grain during the year will govern the volume of grain storage space needed. If the storage space is to be available for public use, a firm estimate of the anticipated income from such an operation should be made in order to determine whether that income will cover all costs. The greater the number of kinds and grades of grain to be received at one time, the greater the number of bins needed. It is estimated that in the Piedmont area, with its production of many grains, any elevator, regardless of the total amount of storage space needed, will have need for a minimum of 12 to 15 separate bins in order to keep the kinds and qualities of grains received from farmers at one time in separate storage spaces.

11. A grain drier to extract moisture from grain will be a necessary unit in all elevators in North Carolina which handle volumes of grains sufficient to make the installation economically feasible. Grain driers should be completely separate units installed outside but close to the bulk storage bins. Grain is usually fed to the drier through the distributor from elevator storage bins, or from grain dumps. It either returns to the bins after drying or is conveyed to railroad cars or motortrucks for transport. The cost of a drier is comparatively high as compared to the cost of other units of equipment. Information indicates that for the maintenance of quality, in more than half the years, a high percentage of all the wheat and corn entering commercial channels in the Piedmont area should be dried before entering storage for any considerable length of time. In some years, the need for drying oats was less pronounced than for corn, wheat, and milo.

12. The control of insect infestation in grain is in part accomplished by the use of facilities and equipment mentioned above, but if deterioration is to be prevented, fumigation, spraying, or other methods of killing insects must be used when the grain is received, while it is in storage bins, or as it is being turned from one bin to another. In the Piedmont area, the prevalence of insect infestation is so pronounced that provision should be made in the flow and turning of grain to allow for efficient treatment. A need may be evident for additional grain bins above normal storage needs, or for a flow of grain from one bin to another in a manner

suitable for applying control measures. Certain temperatures in a grain drying operation will eliminate some kinds of insects in particular stages of their life cycles. However, in the Piedmont area the greatest amount of insect infestation usually occurs in grains which are marketed long after harvest and which have a moisture content suitable for storage without drying.

In addition to the above items a well equipped elevator may include additional equipment such as: (1) One or more magnetic separators for extracting metal from the grain as it flows through the elevator; (2) gauges for recording grain temperatures in bins; (3) man-lifts and stairways for the movement of personnel and equipment from one level to another; (4) dust collectors and exhaust fans; (5) a railroad spur and a grain car dump pit for the receipt and shipment of grain or other products; and (6) safety and fire-fighting equipment for the prevention of loss and injury to personnel and equipment.

The Amount of Grain Storage Facility Requirements Off Farms

Experience in other regions that have well developed grain marketing systems indicates that wheat produced by farmers primarily for cash sale is usually sold soon after harvest and is not stored on farms. The only farmers who usually store their wheat on farms are those producers of large volumes who are financially able to forego the immediate cash income in favor of possibly higher prices. Eventually, with a good marketing system in operation, unless Piedmont area mills which utilize local wheat are in a position to buy and store such wheat as it becomes available soon after harvest, it will move out of the Piedmont area to outside markets. Local producers and processors will lose the economic advantages that exist in the direct movement of Piedmont area wheat to Piedmont area mills. A small movement of wheat to outside areas had already started in 1951.

Other major advantages of the development of off-farm storage and handling facilities for grains are:

1. Mills having control of a supply of grains sufficient to meet monthly requirements may plan an efficient schedule of milling operations whereby labor and equipment may be utilized at maximum efficiency. Certain mill operators indicated that the lack of seasonal receipts from farmers in volumes and qualities to meet current milling needs, especially in later months of the marketing year, curtailed milling operations but did not greatly reduce labor and facilities costs.

2. Maintenance of quality of grains by such operations as turning, drying, and fumigation may be accomplished at less labor and equipment cost per bushel if such operations can be carried on in large volumes with efficient handling equipment, rather than in small volumes with less efficient equipment.

3. With a large volume under one management, price hedging to minimize speculative risks is possible. Hedging operations would not be economical or practical on small individual lots owned by thousands of farmers.

4. Adulterants of processed grain products are those foreign materials, other than permissible additives, which are either repugnant to consumers or detrimental to their health. Grain contamination can be prevented and controlled more effectively in large volumes by responsible management at mills than in small volumes in storage on hundreds of farms.

As indicated previously, it is estimated that at least 80 percent of the wheat crop will move from farms. At the level of 1951 production, this amount would be about 4,116,000 bushels, which must be provided for in off-farm storage space soon after June harvest time.

Data indicate that of the 8,671,000 bushels of oats produced in 1951, something over 1,000,000 bushels moved directly into off-farm utilization channels promptly after harvest. Since oats will be harvested mainly during the same month as wheat, the off-farm storage needs for this grain would be approximately 1,000,000 bushels of space in addition to that needed for wheat.

It is estimated that about 1,000,000 bushels of new corn will move from farms at harvest time in October. However, during the three months of July, August, and September, at least 1,000,000 bushels of wheat will have been utilized by mills, thereby leaving space for the new corn received from farms in October.

The demand for milo by area processors is high, large quantities are imported, and the surplus from farms moves into processing channels rapidly in October and November. The apparent need for off-farm milo storage is approximately 600,000 bushels of space.

The maximum need for off-farm storage space occurs in June, the harvest time of both wheat and oats. Storage space needed at this time for these crops is 5,116,000 bushels. At corn and milo harvest time in October, enough space will have been vacated by the wheat and oats utilized between June and October to store more than the volumes of corn and milo moving from farms in October. However, very few, if any, grain storage facilities can operate with all bins full of grain. Unoccupied space must be available to allow for turning grain from one bin to another for moisture and insect control, to isolate types and grades for processing, and to meet other needs in current operations. An additional minimum amount of at least 10 percent or about 500,000 bushels of space should be allowed for this operative storage. Therefore, the total maximum need for off-farm storage space would be about 5,600,000 bushels.

Mills in 27 counties reported a total storage space for about 2,150,000 bushels of bulk grain, and space for 750,000 bushels of bagged grain. The quality of bagged grain storage facilities found at mills in the area, on the average, was such that only in rare instances could they be used, or adapted for use, for bulk grain storage. Of the various kinds of physical facilities providing the 2,150,000 bushels of bulk storage in the area, it is estimated that 1,500,000 bushels of storage space was in facilities that would provide reasonably good storage (fig. 10).

Therefore, it appears that additional off-farm storage space of a little more than 4,000,000 bushels is required in the entire area.

OFF-FARM FACILITIES NEEDED BY COUNTY GROUPS

The 38 counties in the Piedmont area may be divided into 3 groups with each group having somewhat similar off-farm facility needs. The kinds of facilities needed in each of these 3 groups are discussed rather than the needs by individual counties.

The first group of counties are those in which relatively small amounts of grains are produced, with only small amounts moving off farms and in which only a relatively small amount of grain processing by small mills is carried on. Counties in this group are Ashe, Alleghany, Watauga, Alexander, Stokes, Montgomery, Richmond, Caswell, Person, Alamance, Orange, Durham, Chatham, Anson, Scotland, and Moore.

The amount of surplus grains moving into commercial channels in this group is so small that it would be difficult to justify any substantial installations of storage and handling facilities. The possible volume of grains to be handled by such facilities probably would not be sufficient to repay their costs of construction unless increases in grain production allowed much more surplus grains to move off farms than moved in 1951. These small mills could afford to install a few of the items of equipment necessary to enable them to receive and handle grains in bulk as well as to care for their own grains and prevent weevil infestation. A few mills in this group apparently had well established, though small, grain processing businesses. These mills might well buy at least a part of their grains, especially wheat, from mills in other sections where good storage facilities could be provided more cheaply in connection with larger milling operations.

The second group is made up of counties in which substantially more grains move into commercial channels than are processed by county mills. Counties in this group are Surry, Forsyth, Davidson, Wilkes, Rockingham, Yadkin, Cabarrus, Cleveland, Gaston, Rutherford, and Burke.

In this second group, a total of 26 mills had operations of a size to warrant classification as commercial mills. Only 9 mills of the 26 had physical facilities that would allow for the most economical expansion. At these 9 mills the storage bins were of either metal or concrete, allowing

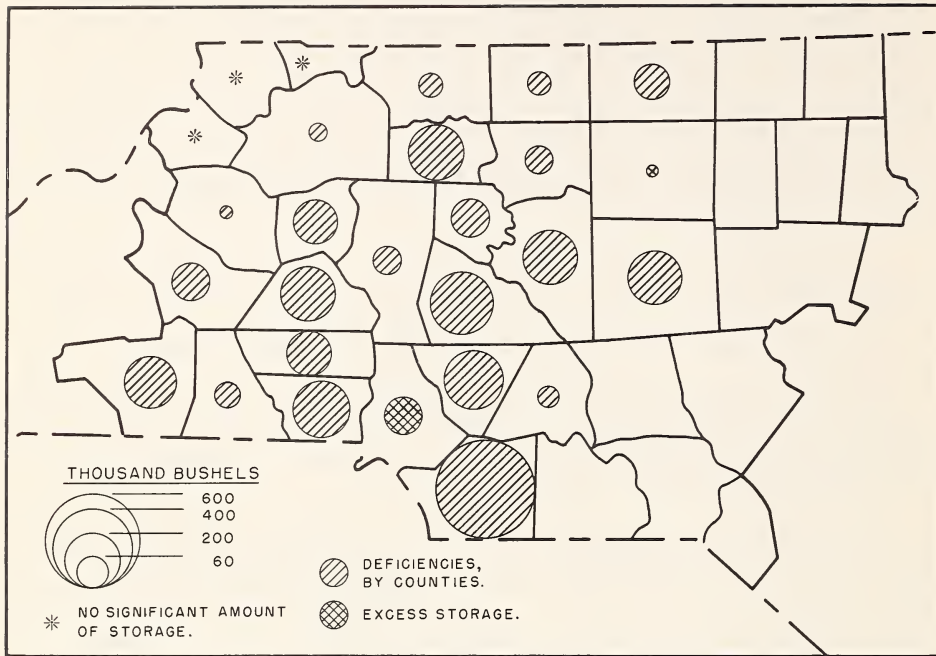


Figure 10.--Bulk off-farm grain storage space deficiencies and excesses following wheat and oats harvests, 1951, 27-county area.

The wheat and oat crops are harvested mainly in June, but their utilization by mills for processing requires a 12-month period. However, an attempt to move these crops into market channels promptly after harvest would have failed for lack of off-farm grain storage space, the deficiency being approximately 4,000,000 bushels. Only two counties had grain storage space for volumes in excess of local county marketed wheat and oats, and this excess was not appreciable.

for the addition of similar bins up to the point of storing a year's supply of wheat needed in processing. These mills all lacked good facilities to receive grain from farmers in bulk but had most of the necessary bulk handling equipment after the grain was received. The addition of needed storage bins, and installation of good truck scales and bulk unloading and loading equipment would enable these mills to operate efficiently in receiving all grain offered by farmers, take care of the grains needed in processing, and load and ship to other mills those grains received from farmers above their local milling needs (fig. 11). These needed facilities could be added at a reasonable cost because the most expensive parts of the complete units are already in operation. The savings in hired labor, prevention of grain quality deterioration, and the increased ability to handle more grain from farmers would make the needed facilities pay for themselves.



Figure 11.--Elevation, storage, drier, and power units are segregated from main work facility.

A compact unit (not located in the Piedmont) for moving, storing, and loading out grain, to which is attached a vertical drier. Watertight construction eliminates the need for grain leg enclosure, greatly decreases the fire hazard and insurance rates. Two legs are fed by a screw conveyor under ground level from a corn husker-sheller located to the left of the picture in a small building. Transport trucks are loaded out from the leg head by gravity chute. This type of facility has proven efficient for rapid handling, drying, and loading out of all bulk grains.

The remaining 17 mills in this group were greatly lacking in facilities and equipment necessary to do an efficient job in grain receiving, storing, and shipping. They had small wooden bins, small scales, no good facilities to receive grain in bulk and had no coordinated method of handling bulk grains after receiving. Many of these mills were on sites too small to allow for expansion, with the structures used in processing covering most of the site, and very limited space for receiving and handling bulk grain. The addition of storage space and good bulk handling facilities to these mills would involve completely new installations requiring substantial investment. Five of these 17 mills were operating substantial milling businesses, especially in livestock feeds; were being managed in a progressive manner; and were looking forward to possible expansion to accompany the apparent increases in local grains moving into commercial channels. Under these circumstances, these mills could afford to install some good receiving and handling and loading-out equipment which would not require a great investment but would save on labor cost and be an inducement to local farmers to bring their bulk grains to these mills where they could get good service. Whether the installation of a completely new unit of storage tanks and handling facilities would be feasible could be determined at a later time. In the meantime, these mills could process feed grains currently received from farmers, move any excess receipts on to mills in other sections, and make progress in the business as the anticipated increases in commercial grains were realized.

The remaining 12 mills out of the 17 probably will not be able to continue to operate successfully without the installation of at least some reasonably good facilities to render good service to farmers. Their processing business is so small that it would not support additional investments, and the type of management apparently was not alert to the changes which were taking place in the grain handling and processing business. Several of these mills were operated in local sections where they had little competition from other buyers, and could give poor service to only a few farmers, forcing many farmers to haul their grains long distances to other mills which could receive them. Unless these mills change their methods of operation, acquire some good receiving and handling equipment, and render good service to farmers, eventually they will probably be forced out of business. Whether they will be replaced by completely new elevators or mills with good equipment to do a good job in grain marketing will depend upon the amounts of grains moving into commercial channels in the respective local areas in the future.

Counties in the third group are those in which the volumes of grains processed by mills were substantially greater than the volumes of grain moving from local farms into commercial channels. Counties in this group include Randolph, Guilford, Iredell, Mecklenburg, Caldwell, Stanly, Union, Davie, Rowan, Catawba, and Lincoln.

In this group are 47 mills, including the largest in the Piedmont area. These mills do the bulk of the commercial grain processing business of the area. Their large volume of processing requires that they import grains from outside the area, as well as buy grain from other counties within the area, mainly in group 2. These mills have the greatest volume of grain storage facilities in the area.

Of the total of 47 mills, 25 had types of storage facilities and grain handling equipment reasonably suitable for efficient operations. They had metal or concrete storage tanks, to which additions could be made at reasonable cost (fig. 12). Some good equipment, such as legs, distributors, and cleaners, were found in each of these mills but in no mill was there found good bulk grain receiving equipment such as large scales, truck hoists, large grain dumps and drags necessary to do an efficient job in receiving bulk grains by truck. A few of these mills had grain driers used mainly to condition their own grains. The needed expansion in storage for grains, especially wheat, could be most economically added to these 25 mills because they are the major users of the grains received from farmers in the area, have much good storage space at present, and apparently have proven their ability to maintain their competitive positions in the processing business by reasonably alert management.

With the addition of efficient bulk receiving equipment, and of storage in the amount necessary to acquire a year's local wheat supply soon after harvest in June, with some operating storage to handle other grains currently, these 25 mills would be in a position to render good service to area farmers in grain marketing. They could also receive grain needed in their processing from the group 2 counties. The saving in labor costs in bulk receiving, as compared to bag receiving; the economies in processing brought about by having an assured supply of grains to stabilize operations; and the savings associated with having, at all times, good-quality grains, especially wheat, available to turn out good-quality processed products, in a few years would more than pay for the additional investments in facilities needed to do this job.

The remaining 22 of the 47 mills have old equipment for handling grains; have wooden storage bins of various sizes located in many mill areas, which is not conducive to efficient bulk handling; use large amounts of bag storage space, and, in general, have very little of value to which good storage facilities and handling equipment could be added. New facilities would mean entire units and not parts of units. These mills were in about the same situation as the 12 mills described in group 2, except that, on the average, they handle more grains and have a greater amount of processing business. Compared to costs for the other 25 mills in this group, the costs of good facilities and equipment in these 22 mills would make up a substantially greater investment. Whether the volume of business would warrant such an investment would depend upon the situation surrounding each individual mill.



Figure 12.--A medium-sized flour and feed mill with good grain storage and handling facilities usually not found in the area. This mill can receive and ship grain by rail or truck with reasonable efficiency, and has space on the site for facility expansion, including storage bins, a grain drier, truck scales, and grain dumps.

It should be pointed out that the best possible facilities and equipment do not guarantee that a good job in receiving, handling and storing grain will be done. Management must operate such facilities efficiently. Good management many times can overcome some poor facilities. Profits at a majority of these mills are based upon incomes from the processing business, with the receiving, handling, and storage of grains as a necessary part of the entire operation. The elimination of high-cost methods of receiving and handling grains would help in decreasing over-all costs. With increased competition in the processing business, the mill with the most efficient facilities for receiving, handling, and caring for grains, combined with the most efficient milling operations, in the future will tend to be in the most advantageous competitive position.

Construction Costs of Off-farm Bulk Grain Storage Facilities

Data collected in 1951 from all principal grain marketing areas of the United States on costs of grain elevator construction, including cost of equipment, ranged from \$0.55 per bushel of storage capacity for elevators of 1,000,000 bushels, to \$1.65 for elevators of 25,000 bushels. The average cost per bushel of capacity for additional construction to enlarge an existing facility was \$0.50 per bushel of capacity for the smaller elevators and \$0.38 per bushel for the larger. The cost of newly constructed storage bins, without equipment, in North Carolina ranged from \$0.39 to \$0.75 per bushel capacity in 1952.

THE ECONOMIC FEASIBILITY OF A SEPARATE STORAGE OPERATION

The establishment of public grain storage facilities, which would purchase grain from farmers, or store for farmers has been considered as a possible solution to the problems of storage and keeping grain in condition in the area. Such an operation separate from the mills would have the following advantages:

1. The management control which could be exercised at a few centralized storage points handling large volumes would tend to bring about more promptly and efficiently the conditioning of grain for storage, and the effective storage of such grains, so as to maintain good quality.
2. Buying and selling grain on established grades and qualities would be brought about more promptly, as this procedure is necessary for the determination of market values.
3. The entire investment in facilities and equipment to do the job in a few large units is usually less than in a larger number of smaller units.

A separate storage operation would have the following disadvantages:

1. An intermediate and separate handler would be established in the commercial grain business in the area, which would, of necessity, be supported

from margins from the grain business. No intermediate handlers exist in the grain business at present in the area, except a few merchant truckers.

2. Information regarding the probable profitability of exclusive grain storage operations in other areas indicates that, if the storage rental income alone at current rates is to support the operation, the minimum storage capacity in one unit should be about 400,000 and 500,000 bushels, and this space should have a comparatively high occupancy throughout the year. In this area, where the grain produced is utilized progressively during 12 months following harvest, and no large amounts of imported grain are stored, the percentage of occupancy would tend to be low, and the necessary storage charges would tend to be high in order to make the investment feasible.

3. Nearly all sections of the area produce and process grain. If the separate storage units were limited to the large units indicated in (2) above, the few units necessary to supply the volume of required off-farm storage could not be distributed through the area and be close enough to farms and mills in many local areas to render good service. They could function as the first receivers of grain only in their immediately surrounding sections. They could not replace the local country buyer of grain having efficient facilities to render all kinds of custom grain services in local sections.

4. Experience in other States would make questionable the economic feasibility of an exclusive storage operation, functioning in competition with a storage operation carried on in connection with other enterprises, in which much greater economy in the use of management, labor, and facilities is possible. Many existing mills already have considerable storage space, and many are already in custom service and sideline merchandising business.

5. There might be a time when the area would increase the production or decrease the processing of grains to the point where surplus whole grains would, of necessity, be shipped from the area. In that event, the market movement of such grains would be served by a storage operation only to the extent that the handling facilities at the elevator could act as a receiver and shipper of grain from farms in the immediate area. It then could exercise its storage function only to the extent of holding grain off a market for speculative purposes. The risks associated with such operations are so great that there would be little or no justification for the operations. The structures necessary to carry on a good grain storage operation are permanently built and, with good maintenance, will last almost indefinitely. They usually have only a small value for any other use. At any reasonable storage rates, the revenue from storage operations alone, even with a rather high rate of occupancy, would tend to make necessary a long-time amortization schedule, in order for the project to pay out.

OPPORTUNITIES AVAILABLE TO MILLS AND ELEVATORS

In the preceding discussion, it is assumed that the local processing mills will continue to be the grain handlers and the buyers of grain within their local areas. The milling operation has dominated the business for many years, while the receiving and handling of grain have been considered only as necessary incidentals to the milling business.

In the long run, it is apparent that the local mill is the logical point around which the expansion of needed facilities should center, for the following reasons:

1. In many cases substantial investments have already been made in storage and handling facilities for grains used in processing.

2. Operators of local mills are already the buyers and handlers of grains in their communities, are familiar with the grain business, and, in many instances, apparently have the good will of the local farmers.

3. The local processing mill has apparently been an economic asset to the community. Managers of certain mills stated, however, that in recent years the competition in the processing business has become severe. It was also said that many mills, mainly of the lower capacities and less efficient operations, have been confronted with declining business and decreased profits. The management of many such mills have already made adjustments in their operations to include custom service operations, selling feeds and farm supplies to farmers, and, in a few cases, receiving and shipping grain to larger mills. In these operations such mills use whatever facilities they may have, too many of which are inefficient. However, experience in other areas in the United States indicates that the multiple-job operation, in which efficient equipment, facilities, and labor are utilized to the maximum, gives an economic operating unit that has proved quite feasible and practical in rendering a necessary service to the community. The processing of food and feed grains may remain as one of the many jobs carried on, but the grain processing business alone, on a small scale, apparently cannot carry the burden of greatly increased costs and competitive prices, and survive. The various services which can be associated economically with the grain business will eventually be performed in the local sections, and the existing investments in suitable facilities and equipment can be saved by the addition of other facilities necessary to do an over-all efficient job.

The various types of enterprises which local mills and grain elevators, with suitable facilities, may operate in order to keep labor and management busy and to utilize all facilities to the maximum may be summarized as follows:

1. Purchase all grain offered by farmers on the basis of standard grades; store after harvest the volume of locally produced wheat needed in yearly processing; and ship surplus grains to larger mills in other sections or outside the area.

2. Purchase all surplus seeds offered by farmers, such as lespedeza, oats, etc.

3. Make the following services available to farmers on a fee basis: (1) Corn husking and shelling; (2) livestock feed grinding and mixing; (3) seed and grain cleaning; (4) provision of grain harvesting equipment for use on farms; (5) grain drying, using either stationary driers at mills or portable driers on farms, or both; (6) storing grain for farmers; and (7) truck hauling of grain or other farm products.

4. Sell the following merchandise to farmers and others in the community: (1) Grains and mixed feeds, and high protein concentrates for mill mixing with farmers' grains; (2) fertilizers and seeds; (3) farm supplies, such as poultry and hog feeding equipment, lumber, machinery, insect sprays, hardware, salt, fuels, fencing, baby chicks, tools, etc.

5. Develop livestock feeding enterprises for economic disposition of husks, corncobs, and other mill byproducts, or locate sources of demand and sell such products.

6. Operate the grain processing business.

It is probable that no single mill or elevator will find itself in a position to engage profitably in all of the operations mentioned. Local competition may eliminate certain possibilities in the local community. However, management which is alert to the needs of the community for the services which can be rendered efficiently will find that, by cautious starts into the various sidelines, labor and facilities can be utilized to the maximum and a profitable business concern can be developed. Some few mills without the best elevator facilities had made substantial progress in the direction of diversification in 1951, and the over-all operations were meeting the growing needs of the communities in which they were located.

ESTIMATED BENEFITS TO BE DERIVED FROM ADEQUATE FACILITIES AND PRACTICES

The economic loss, mainly borne by farmers, caused by the lack of adequate facilities and grain handling practices, is a serious handicap to the grain business of the area. Under the marketing system prevailing in 1951, whereby a high percentage of grain stocks remained on the farms where produced, the grains destined for sale to mills and that which was to be used as feed on farms underwent damage and deterioration.

Experimental data were not available to indicate definitely the actual loss in nutrients and market values, as a percent of total crop, resulting from spoilage from high moisture content and damage by insect infestation to grains produced and stored on farms and at mills. Authorities familiar

with the situation recognized that such losses are quite high, some estimates indicating that they may run as much as 25 percent. ^{6/} If a sliding scale of estimated damage during each 3-month period of the year is used to estimate the loss, ranging from 5 percent in the first 3 months after harvest to 25 percent for the last 3 months, the total wheat and corn crops in the Piedmont area suffer an estimated loss of about 15 percent of their total value each year. The loss in the oats crop, apparently less subject to deterioration and damage than wheat and corn, was estimated at 8 percent. With adequate storage and handling facilities and practices, probably 80 percent of these losses due to deterioration in quality could be prevented. The preventable losses in the corn, wheat, and oats crops produced in the 38-county area in 1951, with the average price of No. 2 wheat at \$1.80 per bushel, No. 2 corn at \$1.50 per bushel, and No. 2 oats at \$0.80 per bushel, would be approximately as follows:

	<u>Production</u>	<u>Value</u>	<u>Total estimated</u> <u>loss</u>	<u>Preventable</u> <u>loss</u>
	<u>Bushels</u>	<u>Dollars</u>	<u>Dollars</u>	<u>Dollars</u>
Wheat	5,147,000	9,264,000	1,390,000	1,112,000
Corn	18,561,000	27,841,000	4,176,000	3,341,000
Oats	<u>8,671,000</u>	<u>6,937,000</u>	<u>555,000</u>	<u>416,000</u>
Total	32,379,000	44,042,000	6,121,000	4,869,000

About 6,858,000 bushels of wheat, oats, and milo were delivered to mills in 1951, and it is estimated that 85 percent of this was delivered in bags. The cost of using a bag one time was estimated to be about 10 cents for each bushel of grain. The cost of these bags, therefore, was about \$584,000. In addition, mill managers estimated that the labor cost of handling and dumping grain from bags was at least 5 cents per bushel more than the labor cost in bulk handling. This additional labor cost would equal \$291,965, giving a total of about \$876,000 for bags and bag handling costs above the costs if the grains had been delivered and handled in bulk. The prevention of loss in quality and savings in bulk handling would result in a total calculated benefit of \$5,745,000 annually for the volume of grains marketed in 1951.

Data were not available to evaluate certain other benefits which would accrue in the operation of an efficient grain marketing system. The savings in time of farmers and farm labor, for example, through bulk handling on farms and at mills would be large. Hours spent in waiting to unload and in unloading could be reduced to minutes, and this is significant to farmers producing tobacco and cotton crops, which require much labor at the time grain is being harvested and marketed.

^{6/} Report of Proceedings, Southern Corn Conference on Insects and Diseases, November, 1951.

APPENDIX

Table 1.--Estimated production of wheat, corn, oats, and milo,
38 counties in Piedmont area, 1951

County	Wheat	Corn	Oats	Milo
:	:	:	:	:
:	:	:	:	:
	<u>Bushels</u>	<u>Bushels</u>	<u>Bushels</u>	<u>Bushels</u>
	(1,000)	(1,000)	(1,000)	(1,000)
Wilkes	90	700	45	---
Alleghany	10	204	15	---
Surry	54	715	121	---
Watauga	5	212	7	---
Ashe	4	350	---	---
Forsyth	165	400	244	3
Davidson	190	450	275	20
Stokes	62	500	100	---
Rockingham	155	525	166	---
Guilford	200	800	300	1
Yadkin	150	400	223	1
Davie	120	300	203	20
Randolph	175	600	320	---
Rowan	330	500	390	---
Iredell	400	750	560	1
Alexander	100	225	135	2
Stanly	400	750	390	494
Anson	150	600	280	---
Union	288	1,340	1,120	480
Cabarrus	160	530	384	90
Mecklenburg	136	420	330	---
Cleveland	150	700	500	15
Gaston	144	315	300	16
Lincoln	234	400	350	---
Rutherford	98	600	220	---
Burke	70	300	90	---
Catawba	272	450	300	---
Caldwell	50	250	60	---
Caswell	100	500	40	---
Person	81	550	40	---
Alamance	166	600	262	---
Orange	72	385	122	---
Durham	20	280	50	---
Chatham	112	550	214	---
Moore	95	420	175	---
Montgomery	55	240	100	---
Richmond	56	325	90	---
Scotland	28	425	150	---
Total				
38 Counties	5,147	18,561	8,671	1,143

Source: Data compiled from Bureau of Agricultural Economics, USDA, and local sources.

Table 2.--Estimated amounts of wheat, corn, oats, and milo moving off farms, 38 counties in Piedmont area, 1951.

County	Wheat	Corn	Oats	Milo
	BusheIs	BusheIs	BusheIs	BusheIs
	(1,000)	(1,000)	(1,000)	(1,000)
Wilkes	18	140	2	---
Alleghany	---	20	---	---
Surry	22	107	18	---
Watauga	---	---	---	---
Ashe	---	---	---	---
Forsyth	82	40	24	1
Davidson	141	203	66	6
Stokes	25	50	20	---
Rockingham	39	131	41	---
Guilford	80	280	42	---
Yadkin	120	40	80	---
Davie	90	120	81	3
Randolph	130	240	128	---
Rowan	264	100	156	---
Iredell	300	300	280	---
Alexander	60	61	51	1
Stanly	300	338	195	370
Union	260	335	672	264
Anson	113	150	140	---
Cabarrus	80	106	108	---
Mecklenburg	102	42	66	---
Cleveland	111	210	125	---
Gaston	100	47	90	8
Lincoln	164	80	105	---
Rutherford	59	150	44	---
Burke	42	45	---	---
Catawba	190	90	90	---
Caldwell	20	37	---	---
Caswell	40	75	---	---
Person	32	82	---	---
Alamance	100	120	78	---
Orange	22	77	37	---
Durham	---	28	---	---
Chatham	67	138	86	---
Moore	38	84	53	---
Montgomery	16	36	25	---
Richmond	17	65	18	---
Scotland	---	106	30	---
Total				
38 counties	3,244	4,273	2,951	653

Source: Data compiled from Bureau of Agricultural Economics, USDA.

Table 3.-- Grain purchased from farmers by mill operators personally interviewed, 27 counties in Piedmont area, 1951

County	Wheat	Corn	Oats	Milo	Soybeans	Barley
	: Bushels	: Bushels	: Bushels	: Bushels	: Bushels	: Bushels
	: (1,000)	: (1,000)	: (1,000)	: (1,000)	: (1,000)	: (1,000)
Wilkes 1/	:	:	:	:	:	:
Alleghany 1/	:	:	:	:	:	:
Surry	: 12	: 37	: 2	---	---	---
Watauga	: ---	: 2	---	---	---	---
Ashe 1/	:	:	:	:	:	:
Forsyth	: 17	: 24	: 13	---	: 1	: 1
Davidson	: 88	: 87	: 65	: 10	: 2	: 7
Stokes	: 23	: 18	: 5	---	---	: 1
Rockingham	: 3	: 3	---	---	---	---
Guilford	: 275	: 51	: 53	: 10	---	: 15
Yadkin	: 2	: 5	: 3	---	---	---
Davie	: 84	: 67	: 27	: 18	---	: 15
Randolph	: 125	: 75	: 33	: 15	---	---
Rowan	: 215	: 43	: 28	: 8	---	: 3
Iredell	: 339	: 198	: 93	: 50	---	: 19
Alexander	: 59	: 60	: 25	: 3	---	: 2
Stanly	: 875	: 462	: 364	: 596	: 18	: 19
Union	: 455	: 245	: 415	: 91	---	: 25
Cabarrus	: 35	: 14	: 4	: 1	---	---
Mecklenburg	: 110	: 19	: 109	: 10	---	: 1
Cleveland	: 79	: 56	: 61	---	---	: 13
Gaston	: 30	: 20	: 5	---	---	: 2
Lincoln	: 175	: 25	---	---	---	---
Rutherford	: 175	: 64	: 18	---	: 1	: 8
Burke	: 13	: 26	: 1	---	---	---
Catawba	: 106	: 37	: 33	: 12	: 2	: 6
Caldwell	: 25	: 6	---	: 1	---	: 2
Total	:	:	:	:	:	:
27 counties	: 3,320	: 1,643	: 1,357	: 825	: 24	: 139

1/ Very few, if any mills.

Source: Management of mills interviewed.

Table 4.--Grain bought by mill operators personally interviewed, from all sources, 27 counties in Piedmont area, 1951 1/

County	Wheat	Corn	Oats	Milo
	Bushels (1,000)	Bushels (1,000)	Bushels (1,000)	Bushels (1,000)
Wilkes <u>2/</u>				
Alleghany <u>2/</u>				
Surry	12	63	4	---
Watauga	---	1	---	---
Ashe <u>2/</u>				
Forsyth	17	29	13	---
Davidson	98	137	75	10
Stokes	23	20	5	---
Rockingham	3	3	---	---
Guilford	685	447	88	11
Yadkin	2	5	3	---
Davie	153	142	67	23
Randolph	375	428	35	15
Rowan	267	104	28	25
Iredell	1,570	1,121	375	50
Alexander	60	77	31	3
Stanly	950	764	364	596
Union	525	435	440	96
Cabarrus	35	15	5	1
Mecklenburg	471	2,378	2,783	730
Cleveland	149	66	61	---
Gaston	50	100	5	---
Lincoln	320	25	---	---
Rutherford	175	74	28	3
Burke	14	30	1	---
Catawba	186	69	58	28
Caldwell	75	50	6	1
Total				
27 counties	6,215	6,584	4,475	1,592

1/ Total grain reported by mill management purchased from farmers and from other sources during 1951.

2/ Very few, if any mills.

Table 5.--Grain purchased from grain dealers by mill operators personally interviewed, 27 counties in Piedmont area, 1951.

County	Wheat	Corn	Oats	Milo
	<u>Bushels</u>	<u>Bushels</u>	<u>Bushels</u>	<u>Bushels</u>
	(1,000)	(1,000)	(1,000)	(1,000)
Wilkes 1/				
Alleghany 1/				
Surry	---	25	2	---
Watauga 1/				
Ashe 1/				
Forsyth	---	5	---	---
Davidson	10	50	10	---
Stokes	---	2	---	---
Rockingham	---	---	---	---
Guilford	410	396	35	1
Yadkin 1/				
Davie	70	75	40	5
Randolph	250	353	3	---
Rowan	52	60	---	17
Iredell	1,230	923	282	---
Alexander	1	16	6	---
Stanly	75	301	---	---
Union	70	190	25	5
Cabarrus	---	1	---	---
Mecklenburg	360	2,359	2,674	720
Cleveland	70	11	---	---
Gaston	20	80	---	---
Lincoln	145	---	---	---
Rutherford	---	10	10	3
Burke	---	4	---	---
Catawba	80	33	25	16
Caldwell	50	44	6	---
Total				
27 counties	2,893	4,938	3,118	767

1/ Very few, if any mills.

Source: Management of mills interviewed.

SOME PUBLICATIONS CONCERNING GRAIN HANDLING FACILITIES,
OPERATIONS AND EQUIPMENT

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